

TECHNICAL CHRONICLE: WHO RUNS THE PROGRAM OF MASTERING SPACE IN THE USSR?

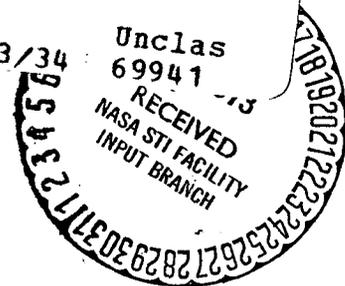
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TECHNICAL CHRONICLE: WHO RUNS THE PROGRAM  
OF MASTERING SPACE IN THE USSR?

S. Yu. Protsyuk

In the 1957-1966 period, there still existed the scandalous /60\* condition in which the Western world, especially the US, had absolutely no idea of who headed the space research program in the USSR. American sources alternately named academicians Blagronravov, Sedov, Tikhonravov, Keldysh, etc. as probable heads of this program, and only when Sergey Pavlovich Korolev died on January 14, 1966 and all Soviet newspapers, radio stations and TV stations reported this event, did the name of the Ukrainian scientist, the chief designer of Soviet space rockets and spaceships, become known to the West. The 1955-1965 years were the years of the apogee of the "cold war," and therefore, the ignorance of the US could at that time be excused as the result of poor communications. But the ten-year "thaw" came in the next decade, with American-Soviet contacts and circles of relations beyond the USSR, and still the West did not know who actually became Korolev's successor. Let's look at the situation in 1971 only. Then, in the magazine New Scientist of January 21, 1971, the name of Professor A. Dmitriyev is referred to as the leader of the orbiting laboratory project (the "Salyut" spaceship) and other interplanetary flight projects. However, the author of the report (Sarah White) places doubt upon the very existence of this professor, and includes him in the fictitious collective sham of the entire group of specialists from the Institute of Space Research of the USSR

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\*Numbers in the margin indicate pagination in the foreign text.

Academy of Sciences.<sup>1</sup> At the same time, the New York Times /61 of March 19, 1971 furthermore provided the name of Valentin Petrovich Glushko (also a Ukrainian, strictly speaking) as the chief designer of Soviet rockets, identifying him simultaneously with the person of "Professor G. Petrovich," the author of many articles on the USSR space program which had appeared in Vestnik Akademii Nauk SSSR and other prestigious Soviet journals and newspapers. However, in the middle of 1971, the very same New York Times turns several somersaults in its detailed information from Moscow by providing the name of Boris Nikolayevich Petrov as the probable head of the astronautical projects of the USSR, because several times he had acted as a spokesman for these projects in special interviews. Again, only on October 26, 1971 when Korolev's successor also died, did the world learn that Mikhail Kuz'mich Yangel' was the man, a person who was actually connected with the Ukraine and Ukrainian scientific institutes, and an active member of the Ukrainian SSR Academy of Sciences, as of 1961, a member of the Central Committee of the Communist Party of the Ukraine at the 22nd and 23rd congresses, and

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<sup>1</sup>We have confirmed that the English reporter erred grossly here. Professor A. D. Dmitriyev is active in the USSR; he was a co-lecturer at the Fourth Plenary Session of COSPAR (Committee on Space Research) in Seattle in 1971. He reported on the design of the automatic satellite "Luna 16." His report was printed in full in the book Space Research XII, Proceedings of the 14th COSPAR Meeting, 1971, Akademie Verlag, Berlin, 1972. We at once say again, that the majority of Soviet space ship designers work not on one project but on many. Thus, for example, Ukrainian scientist V. Ivanchenko was the head of the "Luna 7" project, and later of the "Zond 6" project. Therefore, one should not conclude that Dmitriev was assigned to the development of the "Salyut" project. Both academicians Petrov (see further in the text for information about them as well as about Ivanchenko) worked (together with other scientists) on the "Lunokhod 1" project and probably headed this work.

a member of the USSR Academy of Sciences as of 1966, that is to say, as of the time that he was designated chief designer of space projects of the USSR (See Istoriya A. N. URSR [History of the Ukrainian SSR Academy of Sciences), Vol. 2, Kiev, 1967, p. 475<sup>a</sup>]. It is necessary to surmise objectively that even the New York Times, as far back as May 20, 1971, encountered the name of M. K. Yangel' as the probable successor of Korolev, and went over to the person of B. Petrov later for unexplained reasons (possibly because of the inaccuracy of the information of its Moscow correspondent, T. Shabad, a geographer by profession).

As we have noted, academician M.K. Yangel' died on October 26, 1971<sup>2</sup>, and the fever of "divining out" the person

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<sup>2</sup> The author of these paragraphs wrote about M.K. Yangel' as the head of Soviet space research and an eminent designer of space ships back in 1966 (see the article, "On the Development of Aircraft Manufacture and Rocket Manufacture in the Ukraine," in Visti Ukrainskykh Inzheneriv, No. 3-4 (92-93), July-December 1966, ppm 79-93), and also later, for example, in reviews in Urkains'ke Slovo (Paris), 29 December 1968.

It would not be inappropriate to mention one curious thing which attests, among other things, to the nervous tension connected with the post of spaceship designer; the majority of these designers (such as Korolev, Yangel', Babakin and Voskresens'kyy) hardly lived to be 60 years old.

Numerous sources unintentionally speak of the incredibly heavy psychological burdens that lay on the responsible leaders and participants of the space program in the USSR. L. Vladimirov, in his famous book The Russian Space Bluff, expresses this fact most clearly; however, we find allusions to this in Soviet books and articles also. Thus, Pavel Popovich mentions the sleepless nights and the tired face of S. Korolev (Aviatsiya i Kosmonavtika, No. 8, 1972, pp. 44-45). We encounter a similar statement in the monographs on Korolev by authors A. Romanov, P. T. Astashenkova, in collected memoirs in the book Slovo pro Korol'ova [The Story of Korolev], (Kiev, 1970, series "Lives of Famous People," issue 10).

who replaced him began anew. More and more new names were appearing on the pages of American newspapers and scientific publications, but the relative importance of these persons was not at all established. Thus, for example, English journals stated (with delay) that on August 2, 1971, Georgiy Babakin, who was only 57 years old, had died in Moscow. He was a designer and a scientific worker on space technology, to whom a leading role in the Soviet space program was also attributed. The same sort of role began to be attributed as of 1971 to engineer Leonid Aleksandrovich Voskresenskiy, who, it appeared, was a deputy to S. P. Korolev for a long time. It also appears that Soviet official circles decided to lift the veil of secrecy from the names of active leaders of space research in the USSR (for the most part because of the vogue of "joint" projects such as the Soviet-French and the most recent Soviet-American projects). Thus, the name of Dr. Mikhail Marov was dug up as the designer of the "Venera-8" spaceship and the name of Konstantin D. Bushuyev, designated (in 1972) as head (for the USSR) of the Soviet-American space projects, which are supposed to be realized in 1975 (see New York Times, April 25, 1972). K. D. Bushuyev, born in 1914, and a corresponding member of the USSR Academy of Sciences as far back as 1948, headed one of the design bureaus working on rockets. In 1951 he received the Order of Lenin for his work at that time. In 1957, he received the honored title of Hero of Socialist Labor (and a second Order of Lenin, which comes automatically with the award of this title), probably for cooperation in the launching of the first Soviet "Sputnik." In 1960, he received still a third Order of Lenin.

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New speculations began with respect to the person of academician Petrov, and his name appeared several times in 1972 on the pages of American reports on the Soviet space program, especially concerning its possible goals. The reports always

spoke about "Dr. Petrov," (see, for example, John Noble Wilford: "Russia in Space," Bee-Hive Q., Summer 1972, pp. 20-25; this John Wilford was the first Western journalist who visited the Zvezdnyy Gorodok near Moscow in March 1972, where training of Russian cosmonauts takes place). There is a lot of confusion here, because there are quite a number of Petrovs in the USSR, and it must be noted that in the one All-Union USSR Academy of Sciences alone there are currently as many as five academicians called Petrov: Aleksandr Dmitrovich Petrov (chemist), Aleksander Petrovich Petrov (transport specialist), Nikolai Nikolayevich Petrov (biologist), Boris Nikolayevich Petrov (automation), Georgiy Ivanovich Petrov (gas dynamics). American sources mix up the two latter Petrovs; most frequently they guess B.N. Petrov (born in 1913) but quite often they write about G.I. Petrov (born in 1912) as well, and as a rule, they write about both of them as "Dr. Petrov."<sup>3</sup> For the personages of both academicians, it

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<sup>3</sup>We can still add that Beorgiy Nikolayevich Petrov is also active in modern technology in the USSR. He is an electrical engineer, the member of many technical committees and commissions attached to the USSR Council of Ministers; and there were also two generals called Petrov connected with artillery-rocketry affairs, namely Fedor Fedorovich Petrov (four Stalin Prizes, two Orders of Lenin and a Hero of Socialist Labor) and Ivan Yefimovich Petrov (Hero of the Soviet Union, five orders of Lenin).

We also know about V. Petrov, Candidate of Technical Sciences, senior scientific worker of the "Luna 17" project (see the booklet, "The First Voyage of Lunokhod," Izvestiya publishing house, Moscow, 1970, p. 159), and furthermore Yu. Petrov, Candidate of Medical Sciences, who works on a complex theme. "Man-machine System," which has considerable application in space flight projects. Scientists V. V. Petrov and V. N. Petrov worked on the "Lunokhod 1" project. The former (Vyacheslav Vacheslavovich Petrov), doctor of technical sciences, Professor of the Moscow Aviation Institute, has a particularly great future; in 1971 he received the Award imeni A.A. Andronov (for the basis of the theory of non-linear servomechanisms). The index of the magazine International Aerospace Abstracts, Vo. 2, 1971, counts 29 scientists named Petrov who are connected with space research in the USSR.

would be worthwhile to dwell at least in order to show how unsure is the pathways of guesswork of the Western "specialists." Hence, Boris Nikolayevich Petrov is an eminent scholar of the theory and processes of automatic control, a professor for many years at the Moscow Aviation Institute (MAI), academician-secretary of the Department of Control Mechanics and Processes of the USSR Academy of Sciences, chairman of the Council for International Cooperation in the Field of Study and Master of Space, Chairman of the Scientific Council on Navigation and Automatic Control of the USSR Academy of Sciences, and head of its Department of Technical Cybernetics; 163 he has received many awards and orders, notably the title of Hero of Socialist Labor on March 1971. Georgiy Ivanovich Petrov is a great scholar in gas dynamics phenomena (at supersonic speeds), a research of the condensation drop in turbulent boundary layers who proposed an electrodynamic method of analyzing variations in the wake of a body flying at high speed. He is a professor of many years at Moscow University and on his 50th birthday (1962), he had already had three Orders of Lenin and the title of Hero of Socialist Labor.

It should be noted here and now that it is Georgiy Ivanovich Petrov who has been the director of the famous Institute of Space Research of the USSR Academy of Sciences in Moscow from the moment of its formation in 1966 (the Western world learned of the existence of this Institute only in 1971, when the printed works of institute workers appeared for the first time in scientific-technical journals and in individual collections). But all the same, it was not Georgiy Ivanovich Petrov, but Boris Nikolayevich Petrov who had discussions in 1972 with the representatives of NASA in the US on coordinating the program of the orbiting space stations beginning in 1975.

Thus, at the important meetings and conferences of Soviet and American astronauts headed by Major General Adriyan G. Nikolayev, Aleksey S. Yeliseyev, Konstantin D. Bushuyev, General Thomas P. Stafford, and Glenn S. Lunney, which occurred in Moscow from October 10 to October 18, 1972 (a total of 27 researchers from the American side participated in those meetings), again Boris M. Petrov conducted the conferences and gave the closing speech (New York Times, October 19, 1972).

Reviewing the professional, scientific, and pedagogical careers of both academicians, and especially having analyzed their published works, it is truly difficult to state which of them plays a more important role in the USSR space research program. Perhaps even the Western authors became conscious of the confusion, because speculations about the person of "Dr. Petrov" ceased as of the second half of 1972, at least on the pages of American sources.

To tell the truth, they had already become unnecessary. The Soviet government unearthed itself for the third time for the Western diviners-specialists, and a scientist who no one in the West considered a candidate for this post became the successor of Yangel'. From our information (La Recherche Spatiale, Vol. 11, No. 3, May-June 1972, p. 26) Academician Vasilii Pavlovich Mishin was designated chief designer of space projects quite soon after the death of Yangel'. This time, a scientist was designated who should not have been an enigma to the West because of the fact that at the 50th anniversary of G. I. Petrov in 1962 (when he became corresponding member of the USSR Academy of Sciences in 1968) Mishin himself already gave the speech, ought not to be permitted to pass unnoticed by those people who are interested in space research in the USSR. V. P. Mishin was born on January 18, 1917, completed the Moscow Aviation Institute

in 1941, became a member of the Party during the war (1945). Silenced by their unfortunate predictions, in 1972 the American specialists on USSR technological matters did not make the nomination of Mishin public.

The fact of a certain decrease in the secrecy about the leading scientists of the space program in the USSR has its own explanation and its own reasons. First, the dissatisfaction and disillusionment of the previously mentioned scientists with their status of permanent incognito, with their inability to publish their work freely, with their remaining in the shadows of less deserving people, probably grew to an unbearable level, and for this reason the participants of the research program were freed from secrecy (for propaganda); For example, cosmonauts or participants of international astronomical conferences (COSPAR, IFAC, ICAS) gathered all the laurels both in the USSR and in the leading foreign countries. Another reason could be the fact that space research grew considerably in the USSR and no single person could any longer figure as the sole leader of such research. In the first stage of building up the space program, during the exceptionally centralized efforts of the party, the army, and the science and engineering units of these times, perhaps the dictatorial role of such a Korolev was justified, understandable, and induced by circumstances.<sup>4</sup> At that

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<sup>4</sup>It takes a considerable amount of time and demands special efforts of researchers to define exactly the role of Korolev, Glushko and Chelomey. According to the data known today, Korolev was so much more prominent than the other two, he was his own visionary, and cast his perspective into the long-range future. Therefore, information filters into the West that he was also one of the first to agree to build rockets for clearly military purposes, which explains the especially respectful attitude toward him (and even to his memory today) held by the Soviet ruling circles. All the same, it is

time, the same sort of role was being played by Wernher von Braun in the American program. But the later stage of the highly precise direction of space research and the connection of them with associated scientific fields (such as meteorology, communication with the use of artificial earth satellites, ecological research), made it necessary in the Seventies to introduce a system of "collective" leadership even in the space program, and these leaders had to increasingly adopt the role of coordinating measures rather than direct, inflexible management.

Such "collective" leadership even existed to a certain degree in the Fifties and Sixties as well. However, because of the rigid secrecy regarding personnel, it was, for the most part, not investigated by the West (and even now too). The purpose of the second part of this article is to show the Soviet officials and scientists who were actually the leaders and promoters of rocket and space research in the USSR and who for some reason dropped out of the attention of the wishy-washy and disoriented Western specialists.

First and foremost, it is necessary to confirm the idea that all the "candidates" which were guessed previously as being leaders of the Soviet space research program, whose

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necessary to be careful about such reports -- we, for example, are unable to imagine how in Soviet conditions of terror and false accusations any eminent engineer-scientist at all could "decline" to participate in the USSR military program? In truth, the rare cases (for example, academician Zakharov or, earlier, our Ukrainian academician Kravchuk, or the Armenian scientist academician Orbeli) show that it is possible even for the people in the highest scientific posts to be against the government. The closed silence of the services of Vladimir Nikolayevich Chelomey or Mikhail Kuz'mich Yangel' (he had already died, and he had the post about equal to Korolev's post) can be explained under certain conditions by the fact that they were not as beloved by Moscow as was Korolev.

names were the objects of Western speculation, belong, in the majority of cases, to the group of people who are the main consultants of the government in the complex questions of this program. Here, in the first place, it is necessary to place the academicians: Valentin Petrovich Glushko (i.e., the legendary "Professor G. Petrovich"), Georgiy Ivanovich and Boris Nikolayevich Petrov, and, above all, Vladimir Nikolayevich Chelomey (see about him later). However, in our concept, the following academicians also play an equally important role in various official and secret state committees and commissions involving rocket manufacture and the space program: Vladimir Alekseyevich Kirrilin (leader and coordinator of all scientific work in the USSR, accredited at the Politburo in Moscow), M. D. Millionshchikov (Vice President of the USSR Academy of Sciences), G. I. Sedov (often heading Soviet delegations at international astronomical congresses), V. O. Trapeznikov, V. A. Kotel'nikov, A. M. Kolmogorov, V. A. Vvedenskiy, and without doubt the most important in this century of all enthusiasts of space research, Anatoliy Arkadiyevich Blagonravov. Since more and more older scientists have been dropping out in recent years because of their advanced years (Vvedenskiy, Blagonravov), people born during the second decade of the 1960s twentieth century are becoming the most active people.<sup>5</sup>

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<sup>5</sup>In addition to their official functions in the USSR apparatus, the aforementioned scientists are very eminent specialists of physical-technical sciences: Kirrilin -- high-temperature thermophysics; Millionshchikov and Sedov -- higher mechanics; Trapeznikov, Kotel'nikov and Vvedenskiy -- radio engineering; Kolmogorov -- mathematics; and Blagonravov -- ballistics. As we have already determined, we are omitting the specialists in the fields of Astronomy, Geophysics (physics of the ionosphere), and material studies.

The personage of Millionshchikov ought to be especially interesting to us. The fact that M. D. Millionshchikov was connected with projects in the field of aerodynamics and astronautics is shown to us by the fact that he is the one

However, it is known that scientists are not always suited for carrying out administrative functions, i.e., functions of organizing, financing, supplying materials and equipment, and all other day-to day business. Such functions must frequently be assumed by people of the state apparatus

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who was commissioned to write a review article on TsAGI (Central Aerohydrodynamics Institute) in connection with the institute's 50th anniversary. This article was not simply a chronography of the institute, but a detailed listing and evaluation of the services of certain scientists who were working at the institute between 1918 and 1968 (see Vestnik A. N. SSSR No. 11, 1968, pp. 34-49. Through this article, we find out also what kinds of problems Millionshchikov himself was working on, in which case it was interesting -- involuntarily he tries to emphasize his connection with the eminent scientist academician S. A. Khristiyanovich, and also with G. P. Svishchev (currently director of TsAGI).

We note that M. D. Millionshchikov occupies an especially prominent position in the Soviet apparatus by virtue of the fact that he is always being assigned problems which are simultaneously "delicate" and political-solution oriented. Thus, he was one of the main consultants and publicity men in the UN in New York back in 1965-1966, when a cycle of discussions was organized on the feasibility of international cooperation of scientific circles. Millionshchikov made good use at that time of the UN forum for the non-spontaneous glorifying of the Soviet regime, and this step evoked dissatisfaction even within highly liberal New York circles. Nonetheless, the numerous later speeches by Millionshchikov at international galas were similar and he never softened his "line." Also, in the USSR Academy of Sciences itself, he heads the purge actions, and, if one notes the latest fact, he headed the commission which passed harsh judgement on non-conformist research (biological) by Prof. M. I. Vol'skiy and coworkers (see Izvestiya A. N. SSSR, biological series, No. 4, 1972, pp. 617-647). It is significant that Millionshchikov has already signed himself as "acting president of the USSR Academy of Sciences," which would attest to the possible fall of Keldysh and the eventual replacement of him by Millionshchikov. It should not be forgotten in any case that Millionshchikov is also the vice-director of the famous Institute of Atomic Energy imeni I. V. Kurchatov.

(or, as in the USSR, of the party and state apparatus) and military officials. They provide the program with funds, materials, equipment, and scientific and engineering personnel, and they are the actual directors of the programs. Here, we shall dwell only on several of the main ones of these. Thus, such an official who played a decisive and dominant role in the initial stage of conducting space research in the USSR (1955-1961) was Lt. General Mikhail Vasilevich Khrunichev (died May 1961) who in 1932 had been connected with the USSR defense industry, and in 1938 had held several leading posts in the defense industry (several times a minister, including from 1953 in the famous Ministry of Medium Machine Building of that time (i.e. military machine building), deputy chief of Gosplan USSR, Hero of Socialist Labor, two Stalin prizes, eight Orders of Lenin. His activity for known reasons was never publicized, and many years will pass before we find out anything more definite about this activity.

Also Marshal Nikolay I. Krylov and Maj. General P. Radchenko played quite important roles in Soviet rocket manufacture, particularly in the intercontinental ballistic rocket sector, which in modified forms found application later in space programs as well (see among other sources, the New York Times, November 17, 1963). In general, one has to wonder why Western specialists most frequently bypass army and air force officers, who, by their nature, ought to be among the group of people who head the space program. It is the same as in the US, where the air force plays at least the same role as the well-known state agency NASA, if not a greater role.<sup>6</sup>

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<sup>6</sup>For example, the activity of the so-called Bureau of New Technology of the Ministry of Aircraft Industry (BNT-MAP) is practically unknown in the West. In the immediate post-war

The bare fact that the vast majority of cosmonauts were recruited from among air force pilots already speaks for itself. One has to consider such persons as General Nikolai Pavlovich Kamanin, former famous aviation hero, and currently director of the school for astronauts (in Zvezdnyy Gorodok) or KGB representative Mikhail Galaktionovich Kroshkin as also belonging to the leadership of the Soviet space

years, it was in the premises of the so-called "old TsAGI" in Moscow (on No. 16, Ulitsa Radio), which produces the well-known Ekspres-Informatsiya on all achievements of aeronautics and astronautics outside the USSR. There is data that the BNT-MAP has grown considerably and has moved into new premises in the region of Mityshchi-Chkalovska-Monino (center of secret aircraft research laboratories), and other specialists have come in place of the former director of the bureau, S. A. Shumovskiy.

As far as the very beginning of Soviet rocket building is concerned (1945-1948), one must note the names of designers Yu. A. Pobedonostsev and A. A. Kostikov, who coordinated the work of a large but completely isolated group of imported German specialists who worked on Gorodomlya (a small island in the middle of Zeliger lake or the city of Ostashkovo in Kalininskaya Oblast), and also in the settlement of Nikol'sk on the lower Volga (the place where the cosmodrome of Kapustin Yar was later built). However, it is worthwhile to note here that the Soviet Army did not succeed in obtaining the most eminent German specialists in rocket building, because the great majority of them, headed by Wernher von Braun and Walter Dornberger went over to the Americans and were brought into the US. Specialists imported into the USSR were of a lower caliber and did not contribute as much to the Soviet program as has been written occasionally in the West. Thus, the role of the many Russian specialists of aircraft technology such as, for example, S. A. Khristiyanovich, V. N. Yur'yev, D. A. Ventsel', G. F. Birago, V. F. Bolhovitinov (general of the air force), G. A. Tokayev, and especially Sergey Timofeyevich Kishkin and Mstislav Keldysh (at that time only a professor), was much greater. We note here, above all, that they participated in various state commissions. The role of Stalin's son, air force general Vasiliy, was controversial. On one side, he was particularly interested in accelerating the development of rocket technology in the USSR and took part in the prespective commissions; on the other hand, thanks to his conceited and irrational behavior, he hampered the work of the real experts.

program. In all probability, the numerous and detailed descriptions of the very launching of carrier rockets and spaceships at Tyura-Tam (or even "Baykonur") somehow "got lost" from the attention of Western specialists. These descriptions clearly show that three people were always present and responsible for the entire procedure at such launchings. These are the "chief designer," the "chief theoretician," and a "representative of the government," or else a "representative of the State Committee." At the same time, all Western prognostications revolve about the person of the "chief designer." Virtually nothing is evident in the West concerning the person of the "chief theoretician," or the representative of the government (official title: representative of the State Commission for the Organization of Space Flights). Thus, in connection with the expansion and the reorganization of the Soviet space program, the title "chief designer" acquired a somewhat different content. Once the title was applied only to Korolev.<sup>7</sup> In the Seventies, the people with this title became somewhat more numerous in the program.

Thus, V. Bubarev in his book Kosmicheskiy Perekhrestok [Space Crossroad] (published by Sovetskaya Rossiya in Moscow, 1971, pp. 50-57, 71-80, etc.) speaks about a separate chief designer of the latest automatic, i.e. unmanned space ships, the "Luna 16" and the "Luna 17", (he is also pointed out in the book Pervoye Puteshestviye Lunokhoda [The First Voyage

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<sup>7</sup>Here we have in mind only the USSR astronautical program. Among the personnel of the aircraft building industry, we have many great engineers who carry the title of "chief designer." Only the most capable and eminent researchers have such titles as a rule, such as A.M. Tupolev, S.V. Ilyushin, O.K. Antonov, A.M. Lyul'ka, S. K. Tumanskiy, etc. (we note present day officials). The post of director of a very large design bureau is always linked with the title "chief designer."

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Georgiy Ivanovich Petrov



Sergey Aleksandrovich  
Khristyanovich



S. P. Korolev conversing with  
Yuri Gagarin; center, Air Force  
Marshal Stephan A. Krasovskiy



Mikhail Vasilevich Khrunichev



Yuriy Timofeyevich Dobrovol'  
skiy



Mikhail Dmitrovich Millionsh-  
chikov

of Lunokhod], p. 182). The Ukrainian scientist, Prof. V. Ivanchenko identified as director ("scientific leader" -- a completely new title in the space program) of the "Zond 6" space ship, and the research connected with it Aleksandr Pavlovich Vinogradov was the same kind of director of the program of the "Venera" type space ship. Professor S. L. Mandel'shtam<sup>8</sup> and his collaborators Hans Fisher and Karl Shmelvskiy directed the experimental space ships "Interkosmos 1" and "Interkosmos 4." Professor V. Pisarenko was the scientific director of the "Interkosmos 3" project. Academician Boris N. Petrov headed the group of specialists that are thoroughly studying all aspects of the American "Apollo" programs and space ships.

The conjecture has been made, furthermore, that academician V. Glushko, or even academicians A. Kolmogorov or M. Lavrentiyev could be the chief theoretician.<sup>9</sup> However, the assumption best based in fact is that the chief theoretician might be the president of the Academy of Sciences, Mstislav Vsevolodovich Keldysh himself, whom the TASS communique (on the occasion of his reelection for the third time to the post of President of the USSR Academy of Sciences) mentions with emphasis as a director of projects in the Department of Applied Mathematics of the Mathematical Institute imeni Steklov. Until recently, this

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<sup>8</sup>Prof. S. L. Mandel'shtam is not related to and has nothing in common with academician L. L. Mandel'shtam, the eminent specialist in quantum mechanics and the theory of relativity.

<sup>9</sup>Both academicians were recently in the center of attention of Western reserchers; the Soviet press, and subsequently the American press as well, described him as "Mathematician No. 1 in the USSR" (see the newspaper Nedelya, no. 32, 1972, and Soviet Cybernetics Review, RAND R-700 (S--PR); the second was described as a "Ukrainian academician" by L. Vladimirov in his book The Russian Space Bluff, p. 163.

department was kept in secrecy and worked mainly on military and space projects. It is worthwhile to note here academican G. L. Marchuk, director of the Computer Center of the Siberian Branch of the USSR Academy of Sciences (Novosibirsk), which can also play a special role through its proximity to the Kazakhstan cosmodromes.

It is somewhat more difficult to say something definite about the person of the representative of the State Commission for the Organization of Space Flights. In one of the latest Soviet books, (A. Romanov: Designer of Space Ships, Politizdat, Moscow, 1971, p. 140) his name and patronymic are mentioned -- Konstantin Ivanovich, he is "tall, lean." All in all, however, these characteristics do not fit any of the well-known Soviet state officials.<sup>10</sup> Nevertheless, we have to say that in the Soviet space program the decisive and often dictatorial role is played by several people quite like M.V. Khrunichev in 1955-1961, and now the highest authorities in the USSR are responsible for it before the politburo and

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<sup>10</sup>According to the latest sources (see, for example, Bubarev's work, p. 71) this "President of the State Commission" even this year has been present at all important launches of spaceships in TyuraTam or Plesetsk. The photograph (which we are reproducing) of S. P. Korolev as he converses with a cosmonaut (Gagarin) directly before the carrier rocket launch is instructive here.

The function of "sports commissar" of the cosmonauts is less clear and perhaps less important. At the beginning of the Sixties, I.G. Borisenko had been "sports commissar" for a long time. It is interesting that he was actually the very first person (together with the physicians) to receive the cosmonauts after landing. His photographs did not appear for the first time until 1972, that is with the intentional ten-year lag, see Kryl'ya Rodiny, No. 5, May 1972, p. 20) and Aviatsiya i Kosmonavtika, No. 6, 1972, p. 38. V. Volovich was the physician during the flights of the first cosmonauts; we obtain such various details from the many later recollections of Volovich himself (see the sketch, "We await You Cosmonauts" in the magazine Aviatsiya i Kosmonavtika, No. 6-7, 1972) or of Pavel Popovich (article "I shall fly out in the morning," in the same journal, No. 8, August 1972, pp. 44-45).

the Central Committee of the CPSU. Perhaps the most important person in this case is Dmitry Fedorovich Ustinov, one of the secretaries of the CPSU Central Committee and 168 candidate member of the Politburo (1970). He spent his entire life working in the defense industry, and the USSR war machine. Personally, he is an eminent specialist in armaments and rocket manufacture. All eight of the most important (from a military standpoint) industrial ministries are under his control: The Ministry of Defense Industry, the Ministry of Aircraft Industry, the Ministry of Shipbuilding, the Ministry of the Electronics Industry, the Ministry of Radio Industry, the Ministry of General Machine Building, the Ministry of Medium Machine Building, and the Ministry of Machine Building.<sup>11</sup>

There is no need to doubt in the least that such people as the Minister of Defense Industry, Sergey Alekseyevich Zverev, the Minister of the Aircraft Industry, Petr Vasil'yevich Dement'yev, and above all, the three ministers of machine building: Sergey Aleksandrovich Afanas'yev, Yefim Pavlovich Slavskiy, and Vyacheslav Vasil'yevich Bakhirev are key individuals in all solutions concerning space research in the USSR. The services that they have rendered to the state are evident from the awards and prizes which they hold. For example, it is enough to say that in 1970, Ye. P. Slavskiy already had up to nine Orders of Lenin and not a single scientist or engineer in the USSR has surpassed him in this respect. Less than nothing is known about many of them in the West; let us take everything that we know about Zverev

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<sup>11</sup>The three ministries of machine building have always been an object of particular concern and speculation in the West. Definitely somebody in the USSR has to manage such programs as the manufacture of intercontinental rockets or atomic bombs. The name of the organization does not tell much in itself.

or Bakhirev, or those who spent their whole lives, as their leader Ustinov, working in the defense industry. Actually, those we are noting here refer to the Sixties and to the beginning of the Seventies. The time passes, and new young people come along. By the middle Seventies, i.e. at the end of the Ninth Five-Year Plan, we shall be encountering new names.

Of the current leading people, we note, not so much as organizers, but as "architects (although it would be better to use the word "designers") of the space research program in the USSR, such as Korolev, Yangel'<sup>12</sup>, Mishin, Glushko, and also G.L and B.N. Petrov. However, we also found a name which perhaps has never been noted in the press or in Soviet communiques, namely that of V. M. Chelomey. Now, the personage of Chelomey ought to have drawn out attention long ago. Above all, particularly on account of the fact that he is also a Ukrainian, and we have information on the fact that clever Khrushchev in various situations played Korolev against Chelomey, and vice versa, creating between these two great Ukrainian scientists an attitude of

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<sup>12</sup>In July-September 1972, on the pages of Space Flight, the organ of the British Interplanetary Association, an interesting polemic broke out between the eminent British scientific worker in the field of astronautics, A. Cleaver, O.B.E., and the author of the book The Russian Space Bluff, Leonid Vladimirov (Finkelstein) about the truthfulness of Soviet research in mastering space. During this time, the question of the nationality of the chief designer Yangel' was brought up. Vladimirov maintains that Yangel' is probably a German, and even casts doubt upon the genuineness of his patronymic (Kuz'mich). On the other hand, A. Cleaver does not discount the possibility that Yangel' is a scientist from the USSR, because, according to official data, he was apparently born in Siberia. If it were not so, since 1947 Yangel' worked in the Ukraine and in the meantime it was impossible to establish for what sort of services he was selected immediately as a full academician of the Ukrainian SSR Academy of Sciences (in 1961) without prior corresponding member status.

competition and mutual dislike, thereby weakening the "Ukrainian front" in the arena of space research in the USSR. We succeeded in following the career of Chelomey, and it speaks much about him. Vladimir Nikolayevich Chelomey, born in 1914, studied all the time in the Ukraine, and in 1937 he graduated from the Kiev Aviation Institute. In 1937-1941, he worked as an assistant designer in this institute, and at the same time he participated in the work of the All-Ukrainian Academy of Sciences (VUAN, the name of the Ukrainian SSR Academy of Sciences at that time), and he published a valuable work: "Stability of Plates under Special Conditions" in Zhurnal' Instytutu Matematyky [Journal of the Institute of Mathematics], No. 1, 1938, pp. 105-114). In August 1941, he was evacuated from Kiev to Moscow, where he happened to join the party, and, as a reward, he was made responsible scientific worker of the Central Institute of Aircraft Engine Building (TsIAM) and later (1944) he was simultaneously professor at the famous Higher Technical School imeni Bauman. In the fifties, he was already the leader of a special top secret<sup>13</sup> design bureau for the building of rockets at Tyura Tam, and for his successes in this bureau, he became a corresponding member of the USSR Academy of Sciences (1958). Four years later, he was already a full academician of the USSR Academy of Sciences (1962). Actually, we ought to easily remember the selection of him as academician because at the same time the following became academicians of the technical sciences sector: Boris Yevgenovich Paton (President of the Ukrainian Academy of Sciences), N. A. Dollezhal' (director of the

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<sup>13</sup>L. Vladimirov in the book noted by us states that Chelomey always had free access to the laboratory and research shops headed by Korolev; however, Korolev did not always have free access to Chelomey's design bureau.

Institute of Atomic Installations in Melekes'), V. A. Kirrilin (chief consultant on scientific matters attached to the CC of the CPSU (already mentioned in this article)), M. D. Millionshchikov (vice president of the USSR Academy of Sciences), and N. V. Mel'nikov (specialist on mining matters). If Chelomey, only 48 years old, found himself in the "company" of not only these prominent scientists, but also the organizers of scientific projects and state representatives for assignments of exceptional importance, there evidently had to be some reason for this. And thus, we know quite a bit about Paton, Kirrilin, Mel'nikov, and even Millionshchikov and Dollezhal' (although the two latter direct mainly secret projects). Their names are not removed from the pages of the press or scientific journals; they appear higher and higher not only on the ladder of official science in the USSR, but also on the ladder of the state-command work sector. However, there is not the least inkling of information about Chelomey. However, in our opinion, there is no doubt that Chelomey also rose quite high during the 1962-1972 decade, but he rose in the sector of exceptionally secret research work, and in doing so, had to reconcile himself to the status of a person under concealment in the USSR.

Thus, until 1958, much more was known about his work than, for example, was known about Korolev's work. He is the author of many valuable publications which were printed before 1958 (unfortunately, they were already in the Russian language) such as: Dynamic Stability of Elements of Aircraft Design (1939), On Pneumatic Servomechanisms (1945), On the Possibility of Increasing the Strength of Rigid Systems through the Use of Vibration (1956), and Research on

Pneumatic and Hydraulic Servomechanisms (1958).<sup>14</sup> He also ranked as one of the most knowledgeable Soviet specialists in servomechanisms and their use in automatic control, which, as is known, is the main link in problems of the operation of space ships. Chelomey unconditionally has all the qualifications for being part of the group of active leaders of the space program in the USSR. Moreover, as a scientist-designer (similar to Korolev or Yangel'), he belongs among those who are putting this program into practice (as opposed to the theoreticians-mathematicians or geophysicists and astronomers who outline its general long-range goals). We think that we do not err when we designate for Chelomey a role not too much below the lot of D. F. Ustinov, M. V. Keldysh, and V. P. Mishin. /70

It is only vexing that V. M. Chelomey has to share the unenviable role of the group of highly eminent Ukrainian scientists such as, for example, academicians: O. I. Leypuns'kyi, A. P. Komar, H. D. Latyshev, O. S. Kavydov, S. V. Serensen, H. V. Kurdyumov, A. M. Lyul'ka, H. I. Marchuk, N. P. Fedorenko, M. B. Khrapchenko, E. M. Lavrenko, M. P. Kostenko, O. M. Rumyantsev, A. A. Trofymuk, N. N. Yanenko, V. M. Vdovenko, N. S. Lidorenko, E. I. Hryholyuk, and many others, who are forced to work in a completely Russian environment and who are even "obliged" to not acknowledge their Ukrainian nationality, and thus in the USSR they emerge as some amorphous "Soviet" scientists, and outside the USSR, the unoriented public accepts them directly as "Russian scientists."<sup>15</sup>

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<sup>14</sup>The publishing debut of Chelomey occurred in 1936, when he was only 22 years old and when he had already printed a book on vector calculation (Ukrizmestprom Publishing House, Kiev-Poltava, 120 pp.)

<sup>15</sup>This policy is most painfully reflected in encyclopedic publications (especially the kinds that are also destined

For our part, we are also making an unforgiveable error when we call attention to the names and are enticed by those that appear in the spectacular press information daily, and then we forget them the next day. We, like a beacon, pass from one extreme to another in searching for the meteoric gleams of prominent names in the Ukraine, we live in the narrow present only, and we do not study critically developments of past years, and therefore, we become incapable of giving correct predictions of anything. If we studied systematically the scientific work of our scientists and the prominent designers in the Thirties and Forties, i.e., when they began their professional careers, then the role of Korolev, Glushko, Chelomey, Yangel,<sup>16</sup> and thousands of

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for foreign consumption), and above all in necrologies which appear in prestigious journals in the USSR. We cite only the most recent examples. Thus, not a word was said that Nikolay Vasil'yevich Fedorenko was a Ukrainian, although the necrology covered an entire two pages (see Uspekhi Fizicheskikh Navk [Physical Sciences Accomplishments], Vol. 107, No. 4, August 1972, pp. 712-714). It was only noted that Fedorenko was born in Chern<sup>1</sup>gov to the family of a teacher. The Ukrainian nationality of Yuriy Markovich Kushnir (born in Zvenigorod, Kiev Oblast) was also passed over in silence (see Izvestiya AN SSSR, Physics Series, No. 9, September 1972, pp. 2019-2020). Hundreds of such examples can be cited yearly.

<sup>16</sup>The person of Valentin P. Glushko came into the limelight around the end of 1972, again in the first place, especially after his well-known interview which he gave to the editorial Board of the daily Moskovskiy Komsomolets, October 14, 1972. In this interview, he gave the information that Soviet scientists (under his leadership?) are working on new rocket engines, which will make possible long-range intercontinental flights at unbelievably high speeds in the 1980's. The engines noted were to be of the three-stage type: (1) chemical (liquid or solid fuel for launching the rocket from the cosmodrome), (2) Nuclear drive outside the earth's atmosphere, and (3) electrical (flight into space under conditions of weightlessness). In describing this endeavor of Glushko, Western observers called him "the Soviet Union's leading rocket designer" (New York Times, October 16, 1972). According

other lesser stars in the firmament of the new science of space conquest would be more understandable and clear to us, and we would not have to get lost in permanent and compromised bare prognostication. Therefore, it is imperative for us to be accurately and comprehensively acquainted

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to the information of the German researcher R. Hofstaetter ("Ten Years of the USSR Cosmos Satellite Program," Flugrevue No. 20, October 1972), this very V. P. Glushko is the designer of the PD-214 and PD-119 engine of the carrier rocket of the "Kosmos" series satellites (up to now, 500 such satellites have been launched). The person of Glushko is also shown in recent times somewhat more distinctly in Bol'shaya Sovetskaya Entsiklopediya [Large Soviet Encyclopedia] (Third edition, Vol. 6, 1971, p. 608) along with a photograph (from the Sixties). However, whereas ample information is given on Glushko's work between 1925 and 1950, nothing at all is written about his most important achievements of 1960-1972.

In general, official Soviet historiography of the mastery of space stubbornly clings to a primitive approach, whereby it is allowable to speak only about the services of scientists who are already dead. According to the latest instructions, they write above all about S. P. Korolev, and also occasionally about G. M. Babakin (corresponding member of the USSR Academy of Sciences), academician M. K. Yangel', and Dr. of Technical Sciences, A. M. Isayev; see, for example, the article of A. Mrykin and Yu. Byryukov, "Beginning of the Pathway to the Stars," Visti z Ukrainy, no. 42, (739), October 12, 1972.

The behavior of Western researchers, particularly American researchers who only repeat what they have read in official Soviet sources, is not completely understandable. Thus, in the most important book on the space flight program of the USSR (Soviet Space Program, 1962-1965: Goals and Purposes, Achievements, Plans and International Implications, US Government Printing Office, Dec. 30, 1966), we find only some explanation of the roles of Glushko and Korolev; the names of Yangel' Chelomey, G. I. Petrov, and Mishin are completely absent, and too great a rôle is ascribed to Konstantin N. Rudnev (the predecessor of academician Kirrilin), or academicians Dorodnitsin and Tikhonravov.

with the work of young Ukrainian scientists, because it is from their ranks that the leaders of global and fundamental scientific research programs of the 1980's and 1990's will come forth.

With respect to the study of the personalia of leading scientists in the USSR in general, first and foremost the scientists in the field of space flight (and also, of course atomic technology), in this case it is necessary to be careful not to fall victim of either ignorance of the circumstances or of deliberate distortions and deceptive information from Soviet sources. At the very beginning of the article, we noted the case of Dr. A. Dmitriyev, who appeared to be a fictitious person in the eyes of the Western specialists, and who really existed and worked in the USSR. And on the other hand, names which have for many years appeared in the West to belong to real people (for example, Professor G. Petrovich) were pseudonyms. However, as the experience of the last international conferences and meetings show at least, the official circles of the USSR themselves are forced more and more frequently to remove the veil of secrecy from prominent persons active in the field of space flight, for example, the 14th Meeting of COSPAR (Committee on Space Research) in Seattle from June 21 to July 2, 1971 gives the role and field of work of such scientists as G. I. Petrov, V. V. Petrov, and V. M. Petrov (all three worked on the development of the "Lunokhod 1" project), M. Ya. Marov (two reports on the coefficient of traction of satellites) and many others.

One must not forget either that in the future, considerable changes, not only in personnel, can take place in the field of USSR space travel research, and the very program of this research can also change radically. There should be no doubt that the tragic loss of the crew of the "Soyuz 11"

spaceship (cosmonauts Yuriy Dobrovolskiy<sup>17</sup>, Viktor Patsayev, and Vladislav Volkov) influenced very seriously the future plans of launching manned spaceships in the USSR. These launches have been completely stopped.<sup>18</sup> The idea of unmanned space flights, which V.P. Glushko, B. M. Petrov, and other scientists have been propagating so persistently is only an inconvenient justification of the tragic accident of "Soyuz 11." A report in the French journal, Air and Cosmos, (No. 540, Sept. 30, 1972) criticizes the entire flight as too complicated and risky (especially the exceptionally long stay of the ship in the earth's shadow zone, the complicated procedure of photographing the star groups "Agena" and "Vega") in addition to which, the report lambasts the Soviet scientists for their lag of more than 15 months in providing information on the results of the flight. Actually, the defense of the feasibility of sending out unmanned spacecraft, as such had been promoted in the USSR many years before, particularly when it became evident that Soviet cosmonauts would not be able to land on the moon, and in any case, would not be able to outdo the Americans. We can cite the article of the eminent scientist Professor V. Ivanchenko published in the newspaper Izvestiya back in

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<sup>17</sup>Just like Pavel Romanovich Popovich or Georgiy (Yuriy) Timofeyevich Beregovoy, Yuriy Timofeyevich Dobrovolskiy is a Ukrainian; during the time of his flight (24 days in space from June 6 to June 30, 1971) he was named an honored citizen in the city of his birth, Odessa (see Visti z Ukrainy, No. 27, July 1971, 672).

<sup>18</sup>It is interesting to point out that the International Aviation Federation (FAI) has established the gold medal named for Yu. A. Gagarin, which is supposed to be awarded annually to the cosmonaut who completes the most heroic flight during the given year (see the album-book, Pokoreniye kosmosa [Conquest of Space], Mashinostroyeniye Publishing House, Moscow, 1969, pp. 120-121). Since 1970, these medals have not been awarded to anyone.

October 10, 1965, in which he describes the difficulties of landing on the moon in connection with the launching of the "Luna 7" satellite.

The future will show if the group of Glushko, Petrov, Marov, Mishin, and their fellow workers will triumph, and if it will be possible to begin new attempts to launch spaceships and stations with human crews, which Korolev favored Millionshchikov or Marshal Kutakhov favor at present. Here perhaps begins the next (fourth?) stage of the program of mastering space in the USSR. Up to now, we distinguish three stages of this program: the first from the putting into operation of the first artificial Earth satellite (October 4, 1957) to the flight of the rock and spaceship "Vostok." The second stage was from the launching of the first "Kosmos" satellite (March 16, 1962)- through the "Proton," "Polet," "Molniya," and "Meteor" satellites, to the half-way mark of 1969, when the third stage of putting robot satellites into orbit began. These unmanned satellites included the automatic satellites of the "Luna," "Lunokhod," "Venera," and "Mars" types, and also multipurpose space vehicles (orbiting stations) of the "Soyuz" type, which are capable of remaining in space for an extended period of time. Soviet sources have a nasty habit of providing pictures of space flight specialists from the days when they were quite young.<sup>19</sup> However, it must not be forgotten that such scientists as Glushko, Sedov, or, on the other hand, Kamanin, Ustinov, and others, are reaching their 65-year mark, and new people will inevitable have to come and

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<sup>19</sup>A unique and overestimated publication here is the Entsiklopedicheskiy Slovar, Vol. 1 published in Moscow in 1963. On pages 267 and 540 of this volume, the photographs of Korolev and Glushko are provided; however, these pictures are from the 1920's, i.e., they were made approximately 40 years before the date of the issuance of the dictionary. Glushko's photograph in Bolshaya Sovetskaya Entsiklopediya, Vol. 6 (1971) also dates from about 10 years prior to publication.

take their places. Their names are undoubtedly appearing on the pages of reports, scientific journals, and monographs, and Western specialists are going to have another chance, to the extent that they are qualified to do so, to jot these things down in order to reestablish the importance of the potential of these names.